

Ultrastructure of the Eggs Chorion of *Ceraleptus obtusus* (Brulle, 1839) (Heteroptera: Coreidae)¹

SELAMI CANDAN, ZEKIYE SULUDERE, AND DILEK DURAK, Gazi University, Faculty of Arts and Sciences, Department of Biology, 06500, Ankara, TURKEY and Erciyes University, Faculty of Arts and Sciences, Department of Biology, Yozgat, TURKEY

ABSTRACT. The eggs of *Ceraleptus obtusus* were studied with light and scanning electron microscope. The females were collected from the Sinekci mountain pass of Kaş (Antalya, Turkey) and maintained under laboratory conditions. The oval shaped eggs averaged 1.35 mm in length and 0.74 mm in width. The eggs were dark brown and mat. The egg chorion surface showed a chorionic pattern resulting in irregular hexagonal patterns. There were 18-19 short pipe micropylar projections mounted at the anterior pole. The egg burster was a chitinous and sclerotized structure. Examination of a cross section of the chorion showed that it was composed of three layers.

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INTRODUCTION

The morphological characteristics of eggs, especially the surface of chorion, show distinct differentiation and ootaxonomic significance in various insect orders (Hinton 1981; Salkeld 1983; Margaritis 1985; Gaino and others 1987; Sahlen 1996; Candan 1997). Many authors have studied the surface structure of eggs of Heteroptera species including Coreidae; however, accurate knowledge of the egg morphology is still lacking in many taxonomic groups (Esselbaugh 1946; Puchkova 1955, 1957, 1959; Southwood 1956; Shuzhi 1985; Javahery 1994; Baker and Brown 1994; Suludere and others 1999; Wolf and Reid 2000, 2001; Danielczok and Kocorek 2003). The surface morphology and chorion of insect eggs has been intensively studied by scanning and transmission electron microscope. Generally, the insect egg shell consists of two major layers. There is a very prominent outer sheet, the chorion that may show an elaborate sculpturing on its outer face and carry diverse appendages. The usually much thinner vitelline membrane represents the innermost layer (Hinton 1981; Margaritis 1985). In Heteroptera, depending on the species, micropylar processes vary in number, shape, and size, and enable the gas exchange of the developing embryo. They allow for the passage of sperm through the eggshell prior to fertilization (Esselbaugh 1946; Southwood 1956; Cobben 1968; Javahery 1994). In addition, the role of the egg burster in hatching has been shown previously (Southwood 1956; Cobben 1968; Puchkova 1959, 1961; Hinton 1981). Hatching begins by peristaltic contraction of the body of the prolarva (Javahery 1994). For the first time, the egg structure of *C. obtusus* (Micropylar processes, egg burster, chorion surface, and chorion layers) has been examined in detail by scanning electron microscope, and results of the studies are presented in this paper.

MATERIALS AND METHODS

C. obtusus was collected from the Sinekci mountain pass of Kaş (Antalya, Turkey, 18 June 2000). Fresh eggs

were obtained from a colony maintained in breeding cages and fed on *Vicia* sp. under laboratory conditions. For SEM study, eggs were prepared according to Suludere (1988). Some of the eggs, cleaned and dried, were mounted with double sided tape on SEM stubs and coated with gold in a Polaron SC 502 Sputter Coater. They were examined with a Jeol JSM 5600 Scanning electron microscope at 15 kV.

RESULTS AND DISCUSSION

C. obtusus eggs are usually glued together and laid one by one or one on top of the other on the lower leaves and stalks of *Vicia* sp. Several publications state that the eggs of Heteroptera are firmly attached to the substrate with an adhesive material (Southwood 1956; Cobben 1968; Hinton 1981; Lambdin and Lu 1984; Javahery 1994). The oval shaped eggs are inwardly collapsed on both lateral sides (Fig. 1a,b). The eggs used in this experiment were on average 1.35 mm in length and 0.74 mm in width. Newly laid eggs were creamy light brown but then their color changed slightly to dark brown and mat. Of the various Heteroptera, including most of Scutelleridae, Pentatomidae, and Coreidae, it is standard for the colour of eggs to change during the embryogenesis in insects (Puchkova 1955; Hinton 1981; Javahery 1994; Candan 1997).

Even though it doesn't have a lot of species, Coreidae is different from the other Heteroptera in the structure and shape of its egg chorion. When the surface of the egg is examined by light microscope, the egg surface is smooth and does not have chorionic spines. However, an electron microscope examination shows that the egg surface is covered irregularly with perforated polygons. Polygons are mostly hexagonal and sponge shaped (Fig. 2). The operculum surface is different from the other portions of the egg shell and does not have polygons. The operculum center has short chorionic spines (Figs. 3,4).

A *C. obtusus* egg does not have real operculum and operculum hatching line. After the complete development of the embryonic egg, it splits into two through the lateral hatching line with the help of the egg burster. The hatching line which goes through the middle

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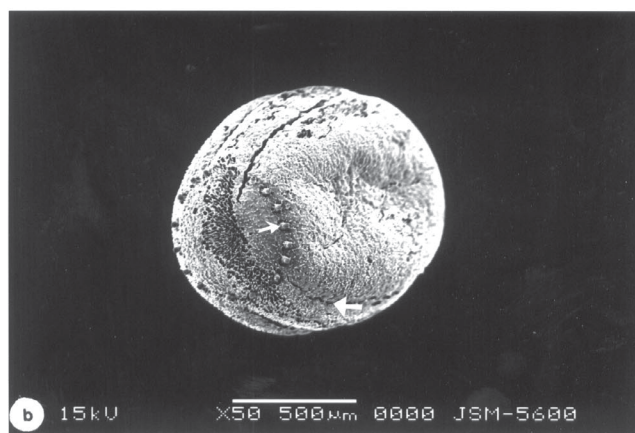


FIGURE 1. Sem photos of egg of *C. obtusus*; a) lateral view and micropylar processes; b) dorsal view, micropylar processes (→) and egg hatching line (→).

of the micropylar ring is separated into two (Fig. 3).

The number of the micropylar processes vary from 18 to 19. They were mounted at the rim of the anterior pole. These processes consist of a basal portion with a short handle and a bulb. The micropylar opening is clearly seen on the tips (Figs. 1a,b; 3). This structure is raised around the cap in a stable ring in Pentatomidae,

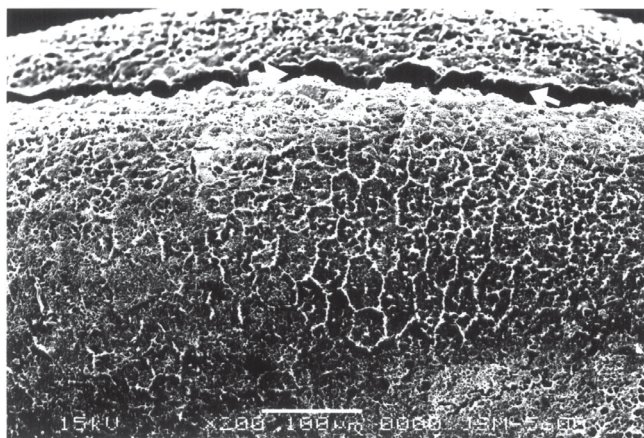


FIGURE 2. Sem photos of egg of *C. obtusus*, egg hatching line (→) and irregular perforated polygons in egg surface.

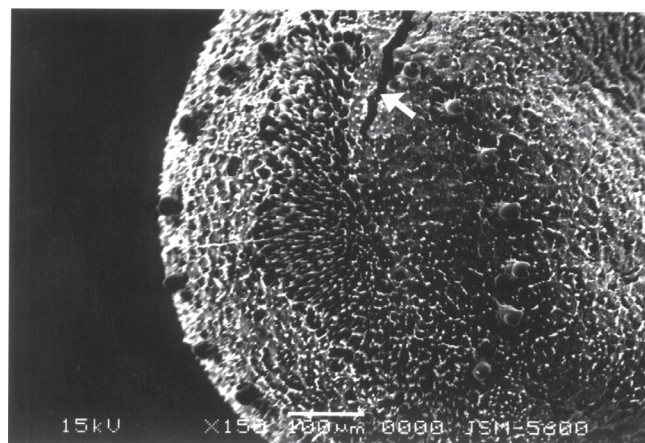


FIGURE 3. Sem photos of egg of *C. obtusus*, micropylar region and egg hatching line (→).

but tends to project from the inner side of the shell in Acanthosomidae, Cydnidae, Scutelleridae, and Thyrocoridae (Javahery 1994; Candan 1997; Candan and Suludere 2003). Depending on the species, micropylar processes vary in number, shape, and size and enable the gas exchange of the developing embryo. In addition, they allow for the passage of sperm through the egg shell prior to fertilization (Esselbaugh 1946; Southwood 1956; Cobben 1968; Javahery 1994; Candan 1997; Wolf and others 2003). Similar characteristics have been observed in *C. obtusus* in our present study (Figs. 1a,b; 3, 4).

The egg burster is a strict and sclerotized structure and is easily seen as a dark domed shape in the hatched egg. Hatching begins by peristaltic contraction of the body of the prolarva from back to front forcing the sharp sclerotized tooth of the egg burster against the side of the egg. (Figs. 5a,b; 6). The incision line or hatching line is a straight longitudinal incision that appears to be the tooth of the burster in the middle of the anterior pole that continues down the fore side (Fig. 5a,b). The egg burster is composed of three different parts. The triangular shape, which presses the egg to open up, has a very thin serozal membrane and its back is harder and citinized, the triangular shape looks

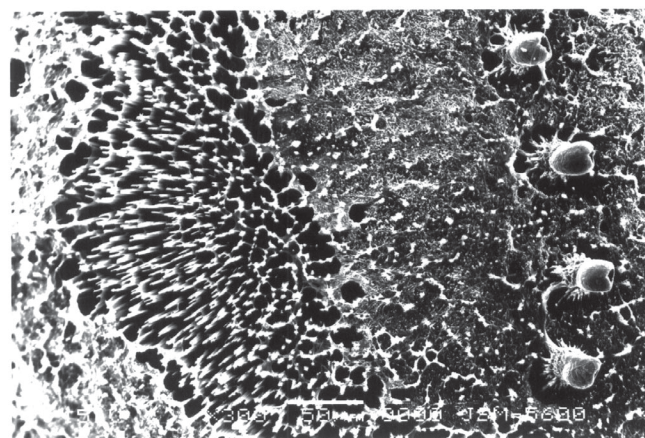


FIGURE 4. Sem photos of micropyles in egg of *C. obtusus*.

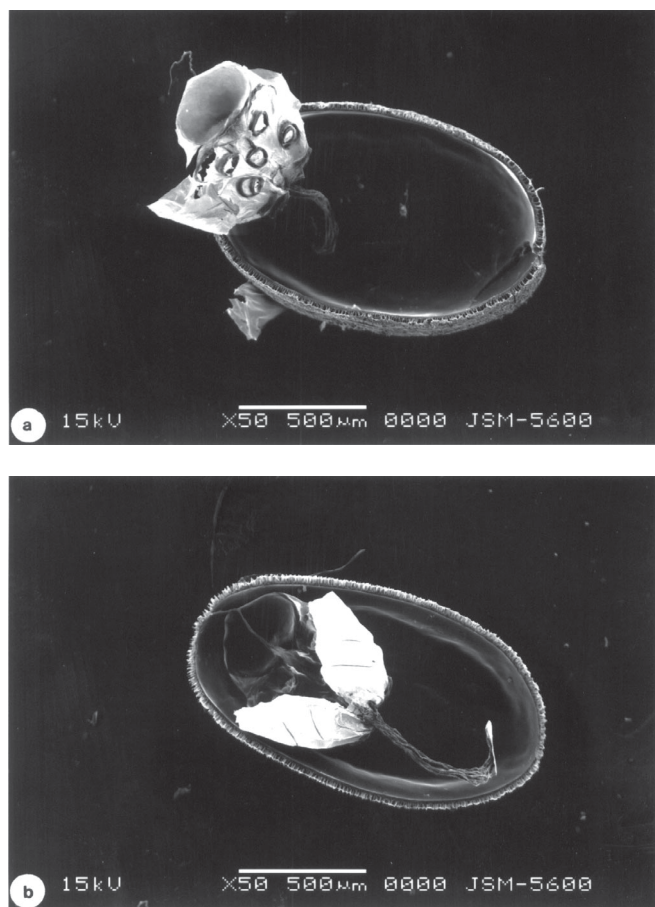


FIGURE 5. a) Sem photo of *C. obtusum* hatched, top view of egg burster; b) Sem photo of *C. obtusum* hatched, bottom view of egg burster.

like a transparent membrane with circular collapses. There are tooth-like structures in these collapses, which are very hard and sclerotized (Fig 6). The role of these structures is unknown. In addition, there is a long tail at the end of the egg burster. The egg burster on hatched eggs does not separate from the eggs; it adheres by its tail to the inner lateral side of the egg (Fig. 5a,b).

The role of the egg burster in hatching has been shown

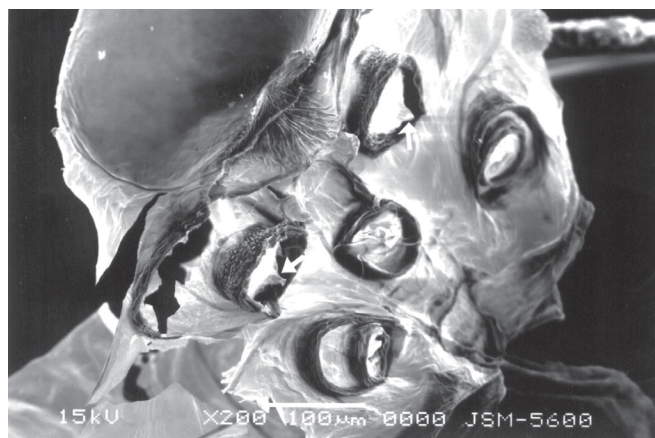


FIGURE 6. Sem photo of tooth-like structure (→) in egg burster of *C. obtusum*.

previously (Southwood 1956; Puchkova 1955, 1961; Cobben 1968; Hinton 1981). In some Heteroptera families, the egg burster is T or Y shaped. Pentatomidae and Scutelleridae have a T-shaped egg burster; Acanthosomatidae, Cydnidae, and Thyrecoridae have a Y-shaped egg burster (Shuzhi and others 1990; Javahery 1994).

The chorion of *C. obtusum* hatched consists of three layers. The endochorion is very thin and smooth. The exochorion is wider compared to the endochorion, and it includes a variety of columns with different lengths and widths and with air sponges. The perforated polygons on the egg surface, which are seen on the scanning electron microscope, form the extrachorion layer. The aeropyle openings on the perforated polygons are open to the air sponges between columns on the exochorion. These may have a plastron respiratory. As a result, the egg is not only able to have a plastron respiratory but can also keep the minimum humidity which is required to provide the egg with enough oxygen (Fig 7).

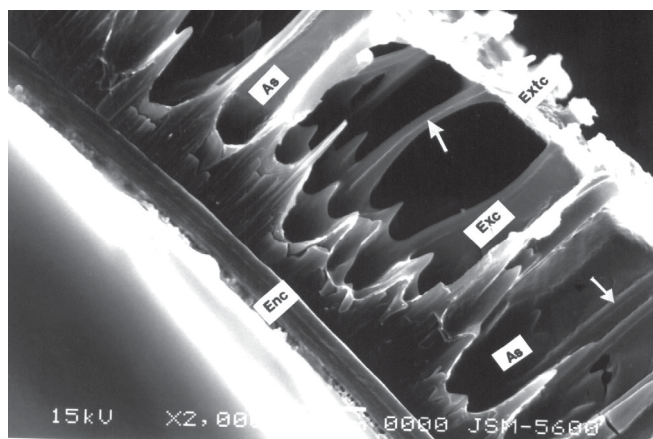


FIGURE 7. Sem photo of chorionic layers of hatched egg of *C. obtusum*; Enc = Endochorion, Exc = Exochorion, Extc = Extrachorion, As = Air sponge, Columns (→).

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